ROTARY POSITIVE-IDSPLACEMENT PUMPS

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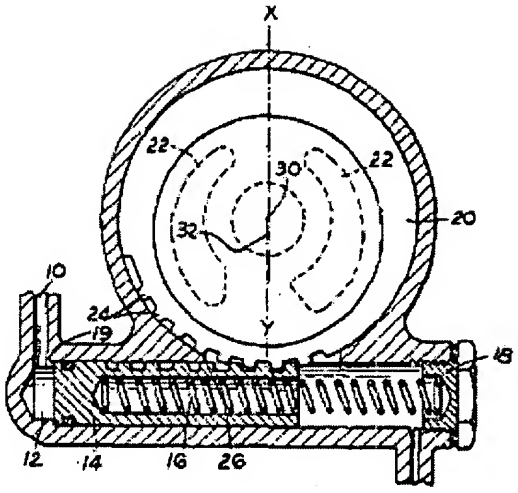
Abstract of **GB1426223**

1426223 Rotary positive-displacement pumps CONCENTRIC PUMPS Ltd 20 March 1974 [15 May 1973] 23195/73 Heading F1F A rotary positive-displacement pump of the kind in which an inner rotor is located within, and rotates in the same direction as, an outer annular eccentrically located rotor, the inner rotor having n lobes and the outer rotor n+l lobes, comprises a ring 20 in which is rotatably journalled the outer annular rotor, the inner periphery of ring 20 being concentric with the outer rotor and the outer periphery being concentric with the inner rotor, and a piston 14 sensitive to output pressure via line 10 and having a toothed rack 26 which engages peripheral teeth 24 on the ring 20, so that the orientation of the line through both axes of the rotors relative to the inlet and outlet ports 22 can be varied to cause a corresponding variation in pump output in dependence on output pressure.



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(54) IMPROVEMENTS RELATING TO ROTARY POSITIVE-DISPLACEMENT PUMPS

(71) We, CONCENTRIC PUMPS LIMITED, of Tyburn Road, Birmingham B24 8HW, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to rotary positive-displacement pumps of the kind comprising an inner rotor provided with n lobes and located in an outer annular rotor provided with m lobes (and m is usually equal to $n+1$) where the inner rotor revolves in the same direction as, and at a greater speed than, the outer annular rotor.

The volume of each pumping space as bounded by the meshing rotor lobes varies between a maximum, at a position on a line containing the axes of both rotors and on one side of the axes, and a minimum at a position on the same line on the opposite side of the axes, and inlet and outlet ports are located on opposite sides of said line. A pump of this kind will be hereinafter identified as "a pump of the kind referred to" and is described for example in the specification of our prior Patent No. 1,098,085.

The objects of the invention are to provide improvements relating to pumps of the kind referred to.

In accordance with one aspect of the invention, a pump of the kind referred to is made substantially self-regulating in output according to demand for fluid in a system to which the pump is connected, by providing for adjustment of the relative positions of said line and said ports, in relation to the fluid pressure in the output side of the pump.

The invention is based on two alternative solutions to the problem of varying the pump output. In one possibility, the pump is provided with a casing and the ports are formed in a plate which is angularly movable relative to the casing and hence about the said axes: the ports are thus moved relative to said line to increase or decrease the output. This may encounter difficulties by way of sealing the plate to the stationary part of the casing and therefore it is preferred to employ the second alternative mentioned below.

According to a preferred embodiment of the invention then, a pump of the kind referred to is made of variable output by locating said annulus in a normally stationary but angularly movable eccentric ring, and said ring is located in the pump casing in such a way that, when the ring is moved angularly, the axis of the outer rotor is displaced angularly about the axis of the inner rotor.

When all three centres, i.e. the centres of rotation of the inner rotor and the outer rotor—the latter being the centre of the inner periphery of the eccentric—and the centre of the outer periphery of the eccentric lie on a straight line and the ports are symmetrical of that line, the pump will be in a maximum output condition. Movement of the ports relative to the line, or as, preferred, movement of the eccentric ring relative to the ports which in effect turns the line relative to the ports, reduces output, and the degree of reduction depends upon the degree of movement: in fact movement through 90° may (depending to some extent upon port configuration) reduce output to zero and movement through 180° may reverse the input and output flow. However for many purposes it will be sufficient—in order to save power required for driving the pump—to vary output between full and half-full.

The means for effecting the turning movement (of the eccentric ring or the plate as the case may be) can be a pressure-sensitive element, e.g. a piston balanced by a spring and exposed to output pressure on one face. Hence, fall in output pressure consequent upon demand for fluid in the system allows the spring to displace the piston, and increase in pressure when the demand ceases or falls allows the piston to be displaced against the spring, and the piston movement may be coupled to provide the turning movement by a rack integral with, or connected to, the piston and meshed with a pinion fast with or integral with the plate or eccentric ring.

The accompanying drawing illustrates,

somewhat diagrammatically, a pump according to the invention. Passage 10 is connected via a T piece to the output from the pump so as to communicate fluid pressure to the space 12 at one end of a cylinder bore in which piston 14 is located. Spring 16 seats in a bore in the piston and against an abutment 18 at the opposite end of the cylinder and tends to urge the piston against a stop 19.

Eccentric ring 20 journals the outer annular rotor (not shown) and is provided with teeth 24 which mesh with rack teeth 26 formed on the piston. The reference numerals 22 indicate the ports of the pump.

The inner rotor of the pump is also not shown but the centre of rotation of the same is indicated by the reference 30. 32 indicates the centre of rotation of the outer rotor and also the centre of the inner periphery of the eccentric ring 20. The chain-dot line XY, which passes through the centres of rotation 30 and 32, is shown symmetrically with respect to the ports 22. When the pump output changes and is accompanied by self-regulating movement of the eccentric ring 20, the axis 32 is displaced angularly about the axis 30 and the line joining the axis 30 and 32 is then asymmetric with respect to the ports 22.

WHAT WE CLAIM IS:—

1. A pump of the kind referred to, adapted for adjustment of the relative positions of said line and said ports, in relation to fluid pressure in the output side of the pump.

2. A pump as claimed in Claim 1, wherein the pump has a casing and the ports are formed in a plate which is angularly movable relative to the casing.

3. A pump as claimed in Claim 1, wherein said outer rotor is located in an angularly adjustable eccentric ring in such a way that, when the ring is moved angularly, the axis of the outer rotor is displaced angularly about the axis of the inner rotor, and wherein the ring is arranged to be displaced by a pressure-sensitive element exposed to the pump output side pressure.

4. A pump as claimed in Claim 3, wherein said element comprises a piston balanced by a spring.

5. A pump of the kind referred to substantially as described with reference to, and as shown in, the accompanying drawing.

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1426223 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*